Electric Sub-Assembly Comprising an Electrically Conductive Contact Pin for Pressing into an Opening of a Printed Circuit Board

The invention relates to a an electric sub-assembly comprising an electrically conductive contact pin for pressing into an opening of a printed circuit board according to the preamble of claim 1.

Pressing contact pins of this type are formed in massive manner from a full piece or in elastic manner by embodying spring openings. Here, the opening of the printed circuit board is metallized, and has predetermined dimensions, i.e. a diameter in case of the usually provided round openings. In contrast, the contact pin has a defined oversize at least in one sub-section to form a press connection in relation to the dimensions of the opening, what defines a press fit. Moreover, as a rule, the length of the contact pin that can be introduced is greater than the depth of the opening, so that the contact pin, once pressed into the hole, passes through the printed circuit board and projects beyond the latter in the introduction direction.

In particular, with massive contact pins deformations in the edge section of the openings appear with printed circuit boards, especially with those made of CEM- or FR4-materials, due to the forces during pressing in. In particular, with non-plated openings there is a risk that the conductor track, lying on the face opposite to the introduction direction of the contact pin, is not contacted. Particularly, also sections of the dielectric basic material of the printed circuit board can be pushed between the contact pin and the conductor track of the printed circuit board once pressed into the pressing

direction. As the dielectric basic material is not capable of being moistened even during a soldering process, contacting cannot be established in such case.

It is the object of the invention to indicate an electric sub-assembly, which circumvents these problems. This object is achieved by the features of patent claim 1. Advantageous further embodiments are provided by the dependent claims.

The invention will be described in more detail in the following taken in conjunction with Figures and examples of embodiments, in which

Fig. 1 shows a sub-assembly with a contact pin according to the invention

Fig. 2 shows a contact pin and a printed circuit board before pressing in.

For avoiding the deformations and, if applicable, herewith involved electrical contact problems the contact pin is oversized only in a first partial length l1.1 in relation to the dimensions of the opening 2, i.e. the diameter D1.1 which is greater in relation to the diameter D2 of the opening extends only over a part of the contact pin and in the introduction direction a second partial length (l1.2) that lies in front of the first partial length with an undersize (D1.2<D2) is provided, which is smaller than the dimension of the opening (D2).

Here, the first partial length l1.1 is smaller than the depth l2 of the hole 2 of the printed circuit board, in such a way that once the pin has been introduced, at least one part of the second partial length l1.2 remains in the hole. This ensures that during pressing in even with massive contact pins there are no or clearly low

deformations of the printed circuit board on the face lying opposite in the introduction direction. Thus, after pressing in a space 7 remains between the contact pin 1 and the opening 5 in the lower edge section, which space with a wise dimensioning is enough to enable a rising of a perpendicular 8 in these spaces 7.

Once pressed into the hole, the edge of the first partial length l1.1 of the contact pin 1 with the oversize D1 contacts the edge 3.2 of the contact zone 3, which corresponds to the dimensions of the opening 2. This results preferably in a cold welding between the contact pin 1 and the contact zone 3 at its edge 3.2 and at the upper side of the printed circuit board a gas-tight solderless press connection is made between the contact pin 1 and the contact zone 3.

The length l1, that can be introduced, of the contact pin 1 is limited by the stop 1.3 formed by the contact pin, the latter being preferably formed axially symmetrical or circumferential at least at two sides for an improved force distribution.

In the shown embodiment the second partial section l1.2 comprises an area of transition to the first partial section l1.1, in which a constant tapering is effected. Thereby, twisting during introduction and a relative concentrical alignment of the contact pin 1 towards the opening 2 are possible.

A contact pin of this type is preferably flow soldered to the printed circuit board on the face lying opposite to the introduction direction of the contact pin. The special advantage of this contact pin becomes apparent if one looks at a corresponding connection, which is drafted in Fig. 1. There, by flowing in of the perpendicular during the flow

soldering, the lower deformation in the lower edge section of the opening 2 of the printed circuit board and the forming of a good soldering connection on the lower side can be recognized, wherein hardly any dielectric printed circuit board material 9 is deformed in this edge section, at least is not brought as far as into the region between the contact pin and the conductor track 6, so that hardly any user problems arise.

A contact pin of this type can be used for connecting electric components of an electric sub-assembly to a printed circuit board, wherein at least one component comprises appropriate contact pins 1 and the contact pins 1 are electrically connected by flow soldering to a conductor track 6 of the printed circuit board 9 on the face lying opposite to the introduction direction.

Moreover, a contact pin of this type is suitable for forming a connection between electrical conductor tracks 3, 6 on the lower and upper side of a printed circuit board, by the contact pin 1 being pressed into an opening 2 of contact zones of the conductor tracks 3, 6 on the upper and lower side of the printed circuit board 9. Here, the stop 1.3 of the contact pin (1) on the face lying in the introduction direction touches the contact zone, located there, of the conductor track 3, whereas the contact pin 1 on the face lying opposite to the introduction direction is electrically connected by flow soldering to the contact zone, located there, of the conductor track 6.

Electric sub-assemblies of this type can be made up with a printed circuit board 9 made of low cost material, in particular CEM1, CEM3 or FR4, which so far had been unsuitable for sub-assemblies with press-in contact pins, particularly massive contact pins. Here, it is not necessary that the opening 2 in the printed circuit board 9

is metallized and can be punched in the printed circuit board 9.

Exactly for these low-cost printed circuit boards obvious cost savings can be achieved by means of the proposed contact pins in connection with the flow soldering process on the lower side.